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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/783,129	02/19/2004	Haifeng Wang	872.0172.U1(US)	1246
29683 7590 04/04/2007 HARRINGTON & SMITH, PC 4 RESEARCH DRIVE SHELTON, CT 06484-6212			EXAMINER TU, JULIA P	
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SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

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<b>Office Action Summary</b>	Application No. 10/783,129	Applicant(s) WANG ET AL.	
	Examiner Julia P. Tu	Art Unit 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1:136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 February 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-48 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7, 9-18, 20-28, 30-34, 36-43 and 45-48 is/are rejected.
- 7) ☒ Claim(s) 8, 19, 29, 35 and 44 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

***Claim Objections***

1. Claims 6, 8, 9, 19, 20, 27, 29, 30, 34, 35, 36, 42, 44, and 45 are objected to because of the following informalities: There are some variables which are not defined; to avoid the rejection for failing to comply with the enablement requirement, the examiner suggests to define all variables in the claim. Appropriate correction is required.
2. The examiner believes claim 26 should be dependent on claim 23; therefore, the examiner suggests to change "A receiver as in claim 22" on line 1 of claim 26 to "A receiver as in claim 23". Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 3, and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Zhao et al. ("A Novel Channnel Estimation Method for OFDM Mobile Communication Systems Based on Pilot Signals and Transform-Domain Processing," IEEE VTC97-Spring, Phoenix, USA, May, 1997).

(1) with regard to claim 1:

As shown in figure 2, Zhao discloses in a receiver of a multicarrier wireless communications system, a method to perform channel estimation to suppress noise jitter over a bandwidth of interest, comprising:

transforming frequency domain channel estimates into the time domain (see figure 2, at M-point DFT, frequency domain is transforming to time domain);

suppressing noise jitter in the time domain channel estimates (see figure 2, lowpass filtering and Zero Padding); and

transforming the noise suppressed time domain channel estimates back to the frequency domain for frequency domain equalization (see figure 2, at N-point IDFT, time domain is transforming back to frequency domain).

(2) with regard to claim 3:

Zhao further discloses the frequency domain channel estimates are transformed into the time domain channel estimates by use of an inverse fast Fourier transform (IFFT) function having a length of the number of pilots per symbol (see block IFFT in figure 1).

(3) with regard to claim 10:

Zhao further discloses the noise suppressed time domain channel estimates are transformed back to frequency domain for frequency domain equalization by a FFT operation having a length of the number of all subcarriers (see block FFT in figure 1).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. ("A Novel Channel Estimation Method for OFDM Mobile Communication Systems Based on Pilot Signals and Transform-Domain Processing," IEEE VTC97-Spring, Phoenix, USA, May, 1997) in view of Chiou (US 2004/0184399).

(1) with regard to claim 2:

Zhao discloses all of the subject matters in claim 1 above except for the channel estimation is based on minimum mean-squared error (MMSE) estimation over comb-type pilot signals.

However, the channel estimation is based on minimum mean-squared error (MMSE) estimation over comb-type pilot signals is well known in the art as it is evident by Chiou (page 3, paragraph [0045]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Chiou into the teaching of Zhao so as to reduce complexity in demodulating data channels as well as to improve the estimation quality and the time of arrival accuracy.

(2) with regard to claim 11:

Zhao discloses all of the subject matters in claim 1 above except for the channel estimation is based on a least squares estimation over comb-type pilot signals.

However, the channel estimation is based on a least squares estimation over comb-type pilot signals is well known in the art as it is evident by Chiou (page 3, paragraph [0045]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Chiou into the teaching of Zhao so as to increase the estimation accuracy.

5. Claims 4, 6, 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. ("A Novel Channnel Estimation Method for OFDM Mobile Communication Systems Based on Pilot Signals and Transform-Domain Processing," IEEE VTC97-Spring, Phoenix, USA, May, 1997) in view of Yamaguchi (US 2003/0227866).

(1) with regard to claim 4:

Zhao discloses all of the subject matters in claim 1 above but does not explicitly teaches suppressing noise jitter comprises using a predefined threshold of actual power or accumulative power to minimize the noise jitter over the bandwidth. However, suppressing noise jitter using a predefined threshold of actual power to minimize the noise jitter over the bandwidth is well known in the art as it is evident by Yamaguchi (page 3, paragraph [0053]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Yamaguchi

into the teaching of Zhao in order to obtain good channel estimates as well as to improve the performance of the communication system (page 4, paragraph [0056]).

(2) with regard to claim 6:

Yamaguchi further teaches suppressing noise jitter comprises preserving time-domain channel estimates with power larger than a predefined power threshold, and setting to zero those channel estimates with power less than the predefined power threshold (page 1, lower part of paragraph [0053]).

(3) with regard to claim 7:

Yamaguchi further teaches the power threshold is adapted based on noise and interference power (page 3, paragraph [0053]).

6. Claims 5, 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. ("A Novel Channnel Estimation Method for OFDM Mobile Communication Systems Based on Pilot Signals and Transform-Domain Processing," IEEE VTC97-Spring, Phoenix, USA, May, 1997) in view of Wang et al. (US 2006/0034363).

Zhao discloses all of the subject matters in claim 1 above but does not explicitly teaches using channel delay estimates made for frame synchronization purposes, preserving the channel estimates at actual tap delays and setting the others to zero.

However, Wang, in the same field of endeavor, teaches preserving the channel estimates at actual tap delays and setting others to zero (page 3, paragraph [0037]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Wang into the teaching of Zhao in order

to avoid intersymbol interference (page 1, paragraph [0011]) as well as to improve the performance of the communication system (page 1, paragraph [0013]).

7. Claims 12, 14, 21, 23, 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. ("A Novel Channel Estimation Method for OFDM Mobile Communication Systems Based on Pilot Signals and Transform-Domain Processing," IEEE VTC97-Spring, Phoenix, USA, May, 1997) in view of Klinski (US 2002/0057738).

(1) with regard to claim 12:

As shown in figures 1 and 2, Zhao discloses a receiver of a multicarrier wireless communications system, comprising:

a channel estimator (see figure 2);

a channel estimation interpolation function to suppress noise jitter over a bandwidth of interest, comprising a unit to transform frequency domain channel estimates into the time domain (see figure 2, at M-point DFT, frequency domain is transforming to time domain);

a unit to suppress the noise jitter in the time domain channel estimates (see figure 2, lowpass filtering and Zero Padding) and

a unit to transform the noise suppressed time domain channel estimates back to the frequency domain (see figure 2, at N-point IDFT, time domain is transforming back to frequency domain).



Zhao discloses all of the above subject matters but is silent about a frequency equalizer. However, including a frequency equalizer for inputting the frequency domain channel estimates in an OFDM system is well known in the art as it is evident by Klinski (block 17 in figure 2). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Klinski into the teaching of Zhao so as to provide a significantly more accurate equalization of the communication system (page 4, paragraph [0045]).

(2) with regard to claim 14:

Zhao further discloses the frequency domain channel estimates are transformed into the time domain channel estimates by use of an inverse fast Fourier transform (IFFT) function having a length of the number of pilots per symbol (see block IFFT in figure 1).

(3) with regard to claim 21:

Zhao further discloses the noise suppressed time domain channel estimates are transformed back to frequency domain for frequency domain equalization by a FFT operation having a length of the number of all subcarriers (see block FFT in figure 1).

(4) with regard to claim 23:

As shown in figures 1 and 2, Zhao discloses a receiver of an orthogonal frequency division multiplex (OFDM) multicarrier wireless communications system, comprising:

a channel estimator operable to perform estimation over received pilot signals to obtain channel estimates (see figure 2);

a channel estimation interpolation function to suppress noise over a bandwidth of interest, comprising a unit to transform frequency domain channel estimates into the time domain (see figure 2, at M-point DFT, frequency domain is transforming to time domain);

a unit to suppress the noise in the time domain channel estimates (see figure 2, lowpass filtering and Zero Padding) and

a unit to transform the noise suppressed time domain channel estimates back to the frequency domain (see figure 2, at N-point IDFT, time domain is transforming back to frequency domain),

where frequency domain channel estimates are transformed into the time domain channel estimates by use of an inverse fast Fourier transform (IFFT) function having a length of a number of pilots per OFDM symbol (see IFFT block in figure 1), and where the noise suppressed time domain channel estimates are transformed back to the frequency domain for frequency domain equalization by a FFT operation having a length of the number of all subcarriers (see FFT block in figure 1).

Zhao discloses all of the above subject matters but is silent about a frequency equalizer. However, including a frequency equalizer for inputting the frequency domain channel estimates in an OFDM system is well known in the art as it is evident by Klinski (block 17 in figure 2). Therefore, it would have been obvious to one of ordinary skill in

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the art at the time the invention was made to combine the teaching of Klinski into the teaching of Zhao so as to provide a significantly more accurate equalization of the communication system (page 4, paragraph [0045]).

(5) with regard to claim 31:

Zhao further teaches the received pilot signals comprise comb-type pilot signals (last line of column 1 in the introduction section).

(6) with regard to claim 32:

Zhao further teaches a receiver embodied in a cellular telephone device (first paragraph of the introduction section).

(7) with regard to claim 33:

As shown in figures 1 and 2, Zhao discloses a receiver of an orthogonal frequency division multiplex (OFDM) multicarrier wireless communications system, comprising:

a channel estimator means for operable to perform estimation over received pilot signals to obtain channel estimates (see figure 2);

a channel estimation interpolation means for suppressing noise over a bandwidth of interest, comprising means for transforming frequency domain channel estimates into the time domain (see figure 2, at M-point DFT, frequency domain is transforming to time domain);

means for suppressing the noise in the time domain channel estimates (see figure 2, lowpass filtering and Zero Padding) and

means for transforming the noise suppressed time domain channel estimates back to the frequency domain (see figure 2, at N-point IDFT, time domain is transforming back to frequency domain),

where frequency domain channel estimates are transformed into the time domain channel estimates by use of an inverse fast Fourier transform (IFFT) function having a length of a number of pilots per OFDM symbol (see IFFT block in figure 1), and where the noise suppressed time domain channel estimates are transformed back to the frequency domain for frequency domain equalization by a FFT operation having a length of the number of all subcarriers (see FFT block in figure 1).

Zhao discloses all of the above subject matters but is silent about an equalizer means for operation in frequency domain. However, including an equalizer for inputting the frequency domain channel estimates in an OFDM system is well known in the art as it is evident by Klinski (block 17 in figure 2). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Klinski into the teaching of Zhao so as to provide a significantly more accurate equalization of the communication system (page 4, paragraph [0045]).

8. Claims 13, 22, 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. ("A Novel Channel Estimation Method for OFDM Mobile

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Communication Systems Based on Pilot Signals and Transform-Domain Processing," IEEE VTC97-Spring, Phoenix, USA, May, 1997) in view of Klinski (US 2002/0057738) and Chiou (US 2004/0184399).

(1) with regard to claim 13:

Zhao and Klinski disclose all of the subject matters in claim 12 above except for the channel estimation is based on minimum mean-squared error (MMSE) estimation over comb-type pilot signals.

However, the channel estimation is based on minimum mean-squared error (MMSE) estimation over comb-type pilot signals is well known in the art as it is evident by Chiou (page 3, paragraph [0045]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Chiou into the teaching of Zhao and Klinski so as to reduce complexity in demodulating data channels as well as to improve the estimation quality and the time of arrival accuracy.

(2) with regard to claims 22 and 24:

Zhao and Klinski disclose all of the subject matters in claims 12 and 23 above except for the channel estimation is based on a least squares estimation over comb-type pilot signals.

However, the channel estimation is based on a least squares estimation over comb-type pilot signals is well known in the art as it is evident by Chiou (page 3, paragraph [0045]). Therefore, it would have been obvious to one of ordinary skill in the

art at the time the invention was made to combine the teaching of Chiou into the teaching of Zhao and Klinski so as to increase the estimation accuracy.

9. Claims 15, 17, 18, 25, 27, 28, 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. ("A Novel Channel Estimation Method for OFDM Mobile Communication Systems Based on Pilot Signals and Transform-Domain Processing," IEEE VTC97-Spring, Phoenix, USA, May, 1997) in view of Klinski (US 2002/0057738) and further in view of Yamaguchi (US 2003/0227866).

(1) with regard to claims 15, 25:

Zhao and Klinski disclose all of the subject matters in claim 1 above but do not explicitly teaches suppressing noise jitter comprises using a predefined threshold of actual power or accumulative power to minimize the noise jitter over the bandwidth. However, suppressing noise jitter using a predefined threshold of actual power to minimize the noise jitter over the bandwidth is well known in the art as it is evident by Yamaguchi (page 3, paragraph [0053]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Yamaguchi into the teaching of Zhao and Klinski in order to obtain good channel estimates as well as to improve the performance of the communication system (page 4, paragraph [0056]).

(2) with regard to claims 17, 27, 34 :

Yamaguchi further teaches suppressing noise jitter comprises preserving time-domain channel estimates with power larger than a predefined power threshold, and setting to zero those channel estimates with power less than the predefined power threshold (page 1, lower part of paragraph [0053]).

(3).with regard to claims 18, 28:

Yamaguchi further teaches the power threshold is adapted based on noise and interference power (page 3, paragraph [0053]).

10. Claims 16, 20, 26, 30, 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. ("A Novel Channel Estimation Method for OFDM Mobile Communication Systems Based on Pilot Signals and Transform-Domain Processing," IEEE VTC97-Spring, Phoenix, USA, May, 1997) in view of Klinski (US 2002/0057738) and further in view of Wang et al. (US 2006/0034363).

Zhao and Klinski disclose all of the subject matters in claims 12 and 23 above but do not explicitly teaches using channel delay estimates made for frame synchronization purposes, preserving the channel estimates at actual tap delays and setting the others to zero.

However, Wang, in the same field of endeavor, teaches preserving the channel estimates at actual tap delays and setting others to zero (page 3, paragraph [0037]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Wang into the teaching of Zhao and

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Klinski in order to avoid intersymbol interference (page 1, paragraph [0011]) as well as to improve the performance of the communication system (page 1, paragraph [0013]).

11. Claims 37, 39, and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. ("A Novel Channel Estimation Method for OFDM Mobile Communication Systems Based on Pilot Signals and Transform-Domain Processing," IEEE VTC97-Spring, Phoenix, USA, May, 1997) in view of Langberg et al. (US 5,852,630).

(1) with regard to claim 37:

As shown in figure 2, Zhao discloses in a receiver of a multicarrier wireless communications system, a method to perform channel estimation to suppress noise jitter over a bandwidth of interest, comprising:

transforming frequency domain channel estimates into the time domain (see figure 2, at M-point DFT, frequency domain is transforming to time domain);

suppressing noise jitter in the time domain channel estimates (see figure 2, lowpass filtering and Zero Padding); and

transforming the noise suppressed time domain channel estimates back to the frequency domain for frequency domain equalization (see figure 2, at N-point IDFT, time domain is transforming back to frequency domain).

Zhao discloses all of the subject matter as described above except for a preamble transmission program for causing a computer, which is housed in a mobile station.



However, Langberg et al. teach that the method and apparatus for a transceiver warm start activation procedure with recoding can be implemented in software stored in a computer-readable medium. The computer-readable medium is an electronic, magnetic, optical, or other physical device or means that can be contain or store a computer program for use by or in connection with a computer-related system or method (column 3, lines 51-65). One skilled in the art would have clearly recognized that the method of Zhao would have been implemented in a software. The implemented software would perform same function of the hardware for less expense, adaptability, and flexibility. Therefore, it would have been obvious to have used the software as taught by Langberg et al. in the invention as taught by Zhao in order to reduce cost and improve the adaptability and flexibility of the communication system.

(2) with regard to claim 39:

Zhao further discloses the frequency domain channel estimates are transformed into the time domain channel estimates by use of an inverse fast Fourier transform (IFFT) function having a length of the number of pilots per symbol (see block IFFT in figure 1).

(3) with regard to claim 46:

Zhao further discloses the noise suppressed time domain channel estimates are transformed back to frequency domain for frequency domain equalization by a FFT operation having a length of the number of all subcarriers (see block FFT in figure 1).

12. Claims 38, 47, 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. ("A Novel Channel Estimation Method for OFDM Mobile Communication Systems Based on Pilot Signals and Transform-Domain Processing," IEEE VTC97-Spring, Phoenix, USA, May, 1997) in view of Langberg et al. (US 5,852,630) and further in view of Chiou (US 2004/0184399).

(1) with regard to claim 38:

Zhao, Langerg disclose all of the subject matters in claim 37 above except for the channel estimation is based on minimum mean-squared error (MMSE) estimation over comb-type pilot signals.

However, the channel estimation is based on minimum mean-squared error (MMSE) estimation over comb-type pilot signals is well known in the art as it is evident by Chiou (page 3, paragraph [0045]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Chiou into the teaching of Zhao so as to reduce complexity in demodulating data channels as well as to improve the estimation quality and the time of arrival accuracy.

(2) with regard to claim 47:

Zhao, Langerg disclose all of the subject matters in claim 37 above except for the channel estimation is based on a least squares estimation over comb-type pilot signals.

However, the channel estimation is based on a least squares estimation over comb-type pilot signals is well known in the art as it is evident by Chiou (page 3,

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paragraph [0045]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Chiou into the teaching of Zhao so as to increase the estimation accuracy.

(3) with regard to claim 48:

Chiou further teaches the above system embodied in a wireless communication terminal (page 3, paragraphs [0034], [0035]).

13. Claims 40, 42, 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. ("A Novel Channnel Estimation Method for OFDM Mobile Communication Systems Based on Pilot Signals and Transform-Domain Processing," IEEE VTC97-Spring, Phoenix, USA, May, 1997) in view of Langberg et al. (US 5,852,630) and further in view of Yamaguchi (US 2003/0227866).

(1) with regard to claim 40:

Zhao and Langberg disclose all of the subject matters in claim 1 above but do not explicitly teaches suppressing noise jitter comprises using a predefined threshold of actual power or accumulative power to minimize the noise jitter over the bandwidth. However, suppressing noise jitter using a predefined threshold of actual power to minimize the noise jitter over the bandwidth is well known in the art as it is evident by Yamaguchi (page 3, paragraph [0053]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Yamaguchi into the teaching of Zhao and Langberg in order to obtain good channel

estimates as well as to improve the performance of the communication system (page 4, paragraph [0056]).

(2) with regard to claims 42 :

Yamaguchi further teaches suppressing noise jitter comprises preserving time-domain channel estimates with power larger than a predefined power threshold, and setting to zero those channel estimates with power less than the predefined power threshold (page 1, lower part of paragraph [0053]).

(3) with regard to claims 43:

Yamaguchi further teaches the power threshold is adapted based on noise and interference power (page 3, paragraph [0053]).

14. Claims 41, 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. ("A Novel Channnel Estimation Method for OFDM Mobile Communication Systems Based on Pilot Signals and Transform-Domain Processing," IEEE VTC97-Spring, Phoenix, USA, May, 1997) in view of Langberg et al. (US 5,852,630) and further in view of Wang et al. (US 2006/0034363).

Zhao and Langberg disclose all of the subject matters in claim 41 above but do not explicitly teaches using channel delay estimates made for frame synchronization purposes, preserving the channel estimates at actual tap delays and setting the others to zero.

However, Wang, in the same field of endeavor, teaches preserving the channel estimates at actual tap delays and setting others to zero (page 3, paragraph [0037]).

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Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Wang into the teaching of Zhao and Langberg in order to avoid intersymbol interference (page 1, paragraph [0011]) as well as to improve the performance of the communication system (page 1, paragraph [0013]).

### ***Allowable Subject Matter***

15. Claims 8, 19, 29, 35, and 44 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Julia P. Tu whose telephone number is 571-270-1087. The examiner can normally be reached on 7:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh M. Fan can be reached on 571-272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

J.T.  
03/28/2007

  
CHIEH M. FAN  
SUPERVISORY PATENT EXAMINER